Memorandum

Copy of Communiqué to JAA

U.S. Department of Transportation
Federal Aviation Administration

Subject:	**Information:** Methods of compliance for Title 14 of the Code of Federal Regulations (14 CFR)Parts 33.51 Operation test	Date:	6/3/99
From:	Thomas A. Boudreau, Manager Engine and Propeller Standards Staff, ANE-110	Reply to Attn. of:	Mark Rumizen 781-238-7113
To:	Willi Jagritsch Austro Control The Austrian Civil Aviation Administration Certification and Airworthiness Schnirchgasse 11 1030 Wien Austria		

Dear Mr. Jagritsch,

This is in response to your letter, dated March 2, 1999, requesting information regarding methods of compliance to Federal Aviation Regulation (FAR) Part 33, section 33.51, "Operation Test".

The Operation Test was established as a certification requirement at the inception of the Civil Air Regulations (CAR 13), and was carried over for the initial issuance of FAR 33 in 1965. For your reference, section 33.51 is restated below:

33.51 Operation test

The operation test must include the testing found necessary by the Administrator to demonstrate backfire characteristics, starting, idling, acceleration, overspeeding, functioning of propeller and ignition, and any other operational characteristic of the engine. If the engine incorporates a multispeed supercharger drive, the design and construction must allow the supercharger to be shifted from operation at the lower speed ratio to the higher and the power appropriate to the manifold pressure and speed settings for rated maximum continuous power at the higher supercharger speed ratio must be obtainable within five seconds.

As with most FAA airworthiness standards, this requirement is stated in general terms to accommodate different design configurations and concepts. FAA policy defining methods of compliance to this regulation has not been established, however the following summary of compliance methods is based on a review of past certification testing:

> Backfire characteristics: Certification experience indicates that intentional inducement of backfire is not always required. In some cases, the engine was evaluated for backfire tendencies during the accel and decel portions of this test. But if backfire did not occur, then it was not induced and the engine was assumed to meet the requirement. However, in some cases, if backfire did not spontaneously occur, the FAA has required artificial inducement to verify that the engine integrity is not compromised. FAA policy for all future certification programs will require artificial inducement of backfire, similar to JAR-E-460, if backfire does not occur spontaneously.

Starting: This requirement is usually satisfied by a combination of starts performed during the endurance test of FAR 33.49, and additional starts performed after the completion of that test. Policy has not been established to define the number of starts required, or to specify low temperature requirements. In some cases, starts performed after the engine has been shutdown for a long period of time (e.g., overnight) are considered cold starts.

Idling: A short period of idle operation is performed during or after the endurance test to verify stable operation at this power level. Policy has not been established to define the time duration of this portion of the test.

Acceleration: Several accels (throttle slams) and decels are performed to verify smooth power transition and absence of backfire. Policy has not been established to define the number of accels, decels, or transient times.

Overspeed: A short period of operation at the specified overspeed limit, or, in some cases, or the evaluation of engine overspeed tendencies during the acceleration test. Policy has not been established to define the requirements for this portion of the test.

Propeller Functioning: Both the endurance test and the operation test are performed with a flight representative propeller. During both of these tests, propeller functioning is verified during transients and steady-state operations. Policy defining specific test parameters relating to the propeller, such as number of pitch change cycles, number of feathering cycles, or reverse pitch operation has not been established by the FAA. Please note that during the certification of variable-pitch propellers in accordance with FAR 35.41, all aspects of propeller functioning are substantiated.

Ignition Functioning: Single-ignition checks are performed during the operation test to evaluate engine operation with one magneto system disabled. The FAA has not established policy specifying the number of test cycles, engine power level, or other test parameters.

Supercharger Gear Ration/Power: These type of superchargers are typically installed on high-power radial engines, which are not currently being designed or manufactured. However, the intent and method of compliance with this requirement is self-evident

Original Signed By:
Thomas A. Boudreau, Manager
Engine and Propeller Standards Staff, ANE-110